JEPS Junior Economists Peer-reviewed Series

Slowly, but Changing: How does Genuine State Dependence Affect Female Labor Supply on the Extensive and Intensive Margin?*

Peter Haan†

JEPS Working Paper No. 06-002
http://jeps.repec.org/papers/06-002.pdf

April 2006

Abstract

In this paper I develop an intertemporal discrete choice model of female labor supply that allows to analyze state dependence and labor supply along the extensive and the intensive margin. Drawing on microsimulation the nonlinearities in the household budget set are captured and thus work incentives of both spouses can be accurately described. Unobserved heterogeneity is modeled nonparametrically and the initial conditions problem is explicitly accounted for. The estimation results show that state dependence is significantly positive at the extensive margin, yet modest on the intensive margin. Using the Markov chain property, I analyze the dynamics of labor supply behavior. I find that labor supply elasticities on both margins differ significantly between the short and long run.

Keywords: Genuine state dependence, labor supply of married women, panel data, unobserved heterogeneity, microsimulation

JEL: C25, C33, J22

*This research project is financed by the German Science Foundation (DFG) in the priority program "Potentials for more flexibility on heterogenous labor markets" (project STE 681/5-1). I would like to thank Arne Uhlendorff, Katharina Wrohlich, Viktor Steiner, Kristian Orsini, Walter Beckert, Richard Blundell, Rainald Borck, Marco Caliendo, Frank Fossen, Oswald Haan, Christian Hochmuth, Dirk Hofmann, and seminar participants at the Berlin Network of Labour Market Research (BeNa), Birkbeck College and the Institute for Fiscal Studies for helpful discussions and comments. The usual disclaimer applies.

†Peter Haan is Research Associate at the DIW, Berlin, Koenigin Luise Str. 5, 14195 Berlin, Germany, email: phaan@diw.de

1 Introduction

Estimating labor supply elasticities on the extensive (labor market participation) and intensive margin (working hours) using a discrete rather than a continuous specification has become increasingly popular in the last years. The main advantage of the discrete choice approach compared to a continuous specification derives from the possibility to model nonlinearities in the budget function of a household. Most of the discrete choice literature is based on cross sectional data and focusses on static labor supply models. Yet, the assumption of static labor supply behavior has been rejected by numerous studies that find strong evidence for genuine state dependence in the labor supply behavior, an early example is Heckman (1981a). The contribution of this paper is to link the discrete choice labor supply framework with research on intertemporal labor supply behavior. The main focus of this study is the analysis of genuine state dependence and of the dynamics of labor supply behavior of married women on the extensive and the intensive margin.

There exist several studies on the labor supply behavior of women in an intertemporal setting, e.g. Hyslop (1999). Of particular interest for this paper are those few studies that focus on both the extensive and the intensive margin of labor supply. Prowse (2005) analyzes transitions of women between no work, part-time and full-time work in an intertemporal context. Using a multinomial probit model, she shows that genuine state dependence is present in both full-time and part-time employment. In a similar intertemporal framework as employed in this study, Michaud and Vermeulen (2004) model the labor supply and retirement decision of households in the US. To the best of my knowledge, for Germany, this is the first study of labor supply behavior on both the intensive and extensive margin in an intertemporal discrete choice setting. A recent study on Germany by Croda and Kyriazidou (2005) focusses on the labor market participation of married women based on data from the Socio-Economic Panel (SOEP). The authors employ several panel data estimators with fixed and random effects. Regardless of their specification, they find strong state dependence of married women on the extensive margin.

This study extends previous work in several dimensions. First of all the focus is not only on the extensive but as well on the intensive margin. Although labor supply effects on the extensive margin tend to be more important (Heckman, 1993), it is necessary to study the intensive margin as well when analyzing the labor supply behavior. This is in particular important for the evaluation of welfare programs such as the EITC in the US, WFTC in the UK or the Mini-job reform in Germany, as these reforms provide opposite incentives for the labor market participation and the working hours (Steiner and Wrohlich, 2005). Further, the analysis is based on a detailed microsimulation model for Germany (STSM)

which maps the relevant regulations of the German tax and benefit system and accounts for child care costs. The striking advantage of microsimulation is that the work incentives of individuals can be accurately described in the household context. For the analysis of the female working behavior controlling for child care costs is very important as the labor supply of married women is in particular affected by child care costs. In this respect this analysis goes beyond most of the previous studies. Furthermore, I model the labor supply of both spouses in a joint utility model where the partners jointly maximize a household utility function. Thus, labor supply of the partner is not exogenously given but explicitly modeled within the framework. The intertemporal discrete choice approach allows to study the dynamics of labor supply. Labor supply elasticities in the short and long term can be derived. This yields important insights for the evaluation of policy reforms as not only the size of the labor supply effects of a given reform but also about the process of behavioral adjustment can be derived.

Based on data from the SOEP, I estimate the intertemporal discrete choice model for married women in Germany for the period 1999-2002. In the econometric analysis, I employ a dynamic conditional logit panel data model with random effects where the choice of discrete labor supply alternatives is estimated conditional on the labor supply of the last period, on individual and alternative specific variables and on unobserved heterogeneity. Unobserved heterogeneity is modeled nonparametrically (Heckman and Singer, 1984). It is necessary to control for unobserved heterogeneity in order to disentangle true and spurious state dependence. The problem of initial conditions is explicitly taken into account. I follow Wooldridge (2005) and specify a model for the unobserved individual effect conditional on time constant individual covariates and the initial state. In the empirical analysis I test for genuine state dependence in labor supply behavior on the extensive and the intensive margin and derive labor supply elasticities on both margins. Using the Markov chain property, I distinguish between the adjustment of labor supply in the short and the long run. My empirical findings are in line with previous studies indicating that genuine state dependence is significantly present in the labor supply behavior of married women. I show that state dependence is high at the extensive margin, yet modest or non existing on the intensive margin. This result drives the dynamics of labor supply elasticities. In the short run, labor supply elasticities are negligible. In the long run, however, the influence of state dependence is relaxed and hence the behavioral adjustment markedly increases. Differentiated by groups, my findings indicate that women with low participation rates, such as women with young children or women living in the western part of Germany have the highest state dependence.

2 Theoretical Background

Intertemporal Discrete Choice Model

Discrete choice models of labor supply are based on the assumption that a household i is faced with a finite number J of discrete bundles of leisure and net household income which provide different levels of utility V_j at period t. In this model I assume that households do not save, thus consumption equals the net disposable income. I follow previous studies, e.g. van Soest (1995) or Blundell, Duncan, McCrae, and Meghir (2000) and model the labor supply decision of couples in a joint framework, by defining a joint utility function with combinations of discrete working hours of both spouses and the resulting disposable household income.[1] In a static discrete labor supply approach the utility is only conditioned on information of the present period t. To model the dynamics of labor supply, I introduce state dependence of labor supply by conditioning the utility in period t on the lagged labor market status of both spouses in period $t-1$. Note, the intertemporal framework proposed here does not describe the labor supply behavior over the full life cycle. The agents are assumed to be myopic in the sense that they do only incorporate their past employment history yet not the future working behavior when maximizing their utility in the current period. In this respect, the model is similar to the intertemporal framework of labor market participation with structural state dependence developed by Heckman (1981c).

$$V_{ijt} = U(lf_{ijt}, lm_{ijt}, y_{ijt}, z_{it-1}, x_{it}, c_i, \epsilon_{ijt}). \tag{1}$$

The utility function of a household U contains an observable and an unobservable component. The observable component includes the leisure time of both spouses, lf_{ijt} and lm_{ijt}, and the net household income y_{ijt}. Further, individual, household and time specific characteristics of both spouses that are constant over the different labor supply alternatives, such as age or nationality (x_{it}) enter the utility function. These variables can be interpreted as taste shifters of the preferences. In addition, the utility is dependent on the realized working hours alternative of the previous period z_{it-1}. This variable is

[1] In contrast to previous work on household labor supply, such as the recent work by Michaud and Vermeulen (2004), I do not consider a collective model where both spouses are involved in a bargaining process to determine their individual leisure and income. Based on the available information in the data strong assumptions about the bargaining process had to be imposed (Beblo, Beninger, and Laisney, 2003). Therefore, I stick to the joint utility model which lacks this flexibility but has been proven to be well identified and robust, e.g. van Soest (1995), Blundell, Duncan, McCrae, and Meghir (2000), or Haan and Steiner (2005).

constant over the alternatives and affects the preferences for leisure and income in the current period. The unobservable component consists of a household specific term $c_i = (c_{im}, c_{if})$ that is allowed to vary for the spouses and of an random error term that varies over time, households and alternatives ϵ_{ijt}. In this framework, the decision rule of a household has the following form: both spouses maximize jointly a household utility given the combination of both partners' leisure time and the household income and they choose the bundle j that provides the highest utility for the household in period t.

According to the empirical distribution of female and male working hours,[2] 13 discrete bundles ($J = 13$) of household income and female and male leisure hours are defined (Table 2). The maximization problem of the household is subject to a budget constraint as net household income depends on the working hours of the spouses, i.e the non-leisure time. The discrete choice model is driven by the probabilities to choose each alternative J. Given these probabilities, the optimal supply of weekly working hours can be determined as the sum of discrete working hours weighted by their probabilities. Due to changes in a household's budget function or due to changes of observed or unobserved characteristics that define the utility it might become optimal for the household to adjust labor supply over time. In a static model it is assumed that a household can adjust labor supply immediately. This assumption, however, is only justified if state dependence does not exists.

State Dependence in Labor Supply

State dependence in labor supply is present if, given the observed and unobserved characteristics, the working behavior of the last period affects the current labor supply decision. This could arise if the employment history is relevant for prices, preferences and constraints of future periods (Prowse, 2005). Intertemporally nonseparable preferences, human capital accumulation, or signalling and scarring effects explain why the current utility for leisure and income is affected by the previous employment history. Further, fixed costs of work such as search or transaction costs are potential sources of state dependence, as these might differ by the previous employment state Hyslop (1999) or Prowse (2005). In the empirical analysis I will distinguish between child care costs which is the major financial burden for women with small children and other fixed costs of work. Child care costs are explicitly accounted for in the estimation and thus they are not part of potential state dependence. This is important when comparing the state dependence of women with and

[2] Figure 1 shows the weekly working hours for women and men. The figures underline the discrete distribution of working hours.

without small children.

State dependence can be positive or negative, yet as underlined by the given examples, the correlation of labor supply over time seems to be positive (Lee and Tae, 2005). In the empirical application, I will test whether the effect of genuine state dependence is positively significant in a model of labor supply. Therefore, I will distinguish between two sources of choice persistence: genuine state dependence and unobserved heterogeneity. Next to genuine state dependence and unobserved heterogeneity, there might be a third source of choice persistence in the data coming from autocorrelation in the error terms ϵ_{ijt}. Amongst others, Hyslop (1999) accounts for serial correlation. Yet, Croda and Kyriazidou (2005) and Michaud and Tatsiramos (2005) reject the hypothesis of a first order autoregressive process in a dynamic labor supply model using micro data for Germany. Therefore, I assume ϵ_{ij1}, ..., ϵ_{ijT} to be uncorrelated over time.

Before discussing the data in more detail in the next section, a look at descriptive statistics of working transitions provides evidence of persistence in female labor supply, stemming either from unobserved or observed heterogeneity or genuine state dependence (Table 1).

[Table 1: about here]

On the diagonal, the persistence of labor supply can be seen. During the time of observation, $1999 - 2002$ the German tax and transfer system was affected by important reforms, the major one being the tax reform 2000. As Haan and Steiner (2005) show, this reform had an important impact on the net disposable income of households. In addition, changes in other variables affecting the preference for work, such as age or children, could lead to transitions in labor supply states. However, the diagonal shows a high persistence in the labor supply of women.

Note, in this study I do not differentiate between voluntary and involuntary unemployment, thus all women choose their hours points voluntarily without facing labor demand side restrictions. This addresses a general shortcoming of the labor supply literature. Following Blundell, Ham, and Meghir (1987), there have been several attempts to introduce involuntary unemployment into a structural labor supply model (Duncan and MacCrae, 1999) or (Bargain, Caliendo, Haan, and Orsini, 2005). Bargain, Caliendo, Haan, and Orsini (2005) derive labor supply elasticities with and without labor market constraints using the same data as employed in this study, and they find that elasticities accounting for involuntary unemployment are significantly lower for singles and men living in couples, yet not significantly different for women in couples. This is because the majority of the inactive married women chooses voluntarily not to work. Thus, the assumption

of a pure choice model for this group is not too restrictive even in a country with high unemployment rates such as Germany.

3 Data Organization

In order to empirically analyze the above derived intertemporal model of labor supply it is necessary to employ panel data information of households. This study is based on the SOEP which is a representative sample of over 12 000 households living in Germany with detailed information about socio-economic variables on a yearly basis.[3] For this analysis, I draw on a balanced panel for the years 1999 - 2002. I concentrate on married couples where both spouses are aged between 20 and 55 years. Excluded are households where at least one spouse is in full-time education, self employed or retired, because labor supply of these groups differ from the rest of the population. After dropping households with missing information 1 647 households remain which are observed over four periods. The first period is required to construct the initial state of labor supply. Thus, information of three periods enters the estimation proving variation over time and between the alternatives. As described above, the working alternatives are defined according to the empirical distribution of working hours of the population; in each alternatives the average of working hours within the given alternative are assigned to the households (Haan and Steiner, 2005).

[Table 2: about here]

The first three columns in Table 2 yield information about the working alternatives and the percentage of households choosing these categories. In Germany, part-time work for men is very unusual. Therefore, the choice set for the male spouse is simply no work, full-time and over-time. Women can choose between inactivity, two part-time categories, full-time and over-time. Dropping two unusual combinations, where the woman is working part time and the man is not working, 13 discrete choices of working hours have been defined. As expected, in this sample, the male labor market participation is far higher than the participation of women. Whereas nearly 95% of all men supply positive working hours, only about 75% of the women participate on the labor market.[4] Part-time work is very common for married women. More than 40% of the female population works part-time. Interestingly, that holds not true for the eastern part of Germany which can be seen

[3] For a detailed description of the data set, see Haisken De-New and Frick (2003).

[4] These participation rates exceed the participation rates of the whole working population as I focus on an age group with relatively high participation rates.

in the last column. This, and the higher female participation rate in east Germany point at the still very different labor market behavior in east and west Germany.

In column (4), the average disposable net household income in each alternative is tabulated. The net household income is derived on basis of the microsimulation model STSM (Steiner, Haan, and Wrohlich, 2005). The simulation model maps the German tax and transfer system in detail. Based on variables drawn from the SOEP that determine gross income and benefits for all household members, disposable net income is simulated at the household level. The largest share of gross income being working income is calculated on basis of the alternative specific working hours and a constant hourly gross wage.[5] The detailed modeling of the net household income is in particular important for the estimation of labor supply effect as this is the most accurate way to describe the work incentives (Laroque and Salanie, 2002). Actual child care costs are very high in Germany. This is due to the limited number of subsidized child care facilities (Wrohlich, 2006). For this analysis the actual child care costs for households with children younger then 6 years have been imputed.[6] The child care costs are subtracted from the simulated net household income for the relevant households.

Comparing the net household income over the alternatives, it becomes obvious that due to non labor market income and due to the tax and benefit system in Germany the difference between the income in the categories is relatively moderate. Note, as in Germany, income is jointly taxed with full income splitting, additional hours of the spouse of a full-time working partner do only modestly affect the net disposable household income. This is due to the high marginal tax rates which the secondary earner faces in a married household (Steiner and Wrohlich, 2004).

Households‘ preferences for income and leisure might differ by individual and household specific characteristics such as age, region or the number of children. As the literature has shown, in particular the number of young children is important for labor supply of women. In Table 3 the share of households with children of a certain age group by hours categories is listed. These statistics provide strong evidence that women with young children do not work. In the last column the expected child care costs for household with children younger than 6 years are shown. Following Wrohlich (2006) I distinguish between part-time and full-time care and assign the costs to those alternatives where both spouses are working dependent whether the wife is working full-time, over-time or part-time.

[5] For non working individuals hourly wages are estimated on basis of a Heckman selection model. For the specification and the results of the wage estimation, see Steiner, Haan, and Wrohlich (2005).

[6] Child care costs are estimated based on individual and regional information. They differ by age of the child. I thank Katharina for providing the data.

[Table 3: about here]

Table 4 provides information about all individual and household specific variables employed in the estimations.

[Table 4: about here]

4 Econometric Specification

Initial Conditions Problem

In the following, I will develop the econometric model and discuss the estimation procedure in detail. As described in equation (1), the utility in period t is conditioned on the lagged dependent variable z_{it-1}. This leads to the problem of initial conditions when estimating the model because the initial working alternative of an individual cannot be assumed to be random. This is a general problem of a dynamic specification which has been widely discussed in the econometric literature. In numerous empirical applications the initial conditions problem is tackled by modeling the initial state following the method suggested by Heckman (1981b). Lee and Tae (2005) and Croda and Kyriazidou (2005) follow a different approach: they employ a dynamic conditional logit model with fixed effects, developed by Honore and Kyriazidou (2000). The advantage of this approach is that the unobserved heterogeneity c_i is removed such that no assumptions about the endogeneity of the unobserved effects have to be imposed. As in this approach c_i drops out the initial conditions problem does not arise. However, this flexibility has several drawbacks one of them being that partial effects are not identified which is crucial to determine the amount of state dependence (Wooldridge, 2005).

In order to solve the problem of initial conditions, I employ another estimation strategy that builds on the approach suggested by Chamberlain (1980) and Wooldridge (2005). This approach has been applied in similar studies, such as Michaud and Vermeulen (2004), Michaud and Tatsiramos (2005) or Lee and Tae (2005). It is based on the assumption that the conditional expectation of the unobserved household effect $h(c_i|z_i0, x_i; \delta)$ is correctly specified, conditional on the initial state z_{i0} and on household and individual specific variables that are constant over time (x_i). In other words, the assumption implies that there exists a linear projection of exogenous variables, the initial state z_{i0} and further observed

individual variables (x_i) and an error term a_i that explains the unobserved individual effect. Vector (x_i) includes the mean values of all individual and household specific variables, age, number and age of children, health status, region and nationality.[7] The unobserved household specific error term a_i captures the remaining unobserved heterogeneity that is by definition uncorrelated with z_{i0} and (x_i). In the estimation I allow a_i to be different for both spouses, $a_i = (a_{im}, a_{if})$ and model potential correlation. Inserting the model of the unobserved household specific effect c_i into the above defined utility function, the utility of alternative j becomes:

$$V_{ijt} = U(lf_{ijt}, lm_{ijt}, y_{ijt}, z_{it-1}, x_{it}, c_i(z_{i0}, x_i, a_i), \epsilon_{ijt}). \quad (2)$$

Drawing on McFadden (1974), I assume the error terms ϵ_{ijt} to follow a Gumble distribution. Then, a dynamic conditional logit model can be derived where the probability of choosing alternative j from all J alternatives conditional on the explanatory variables in period t, the chosen alternative of the previous period and the unobserved individual effect has the following form:

$$Pr(V_{it} = j) = \frac{\exp U(lf_{ijt}, lm_{ijt}, y_{ijt}, z_{it-1}, x_{it}, z_{i0}, x_i, a_i)}{\sum_{r=1}^{J} \exp U(lf_{irt}, lm_{irt}, y_{irt}, z_{it-1}, x_{it}, z_{i0}, x_i, a_i)}. \quad (3)$$

Unobserved Heterogeneity

The household specific error term $a_i = (a_{im}, a_{if})$ is specified nonparametrically following Heckman and Singer (1984). I assume that the household specific error term is described by a bivariate discrete distribution with two points of support (mass points) for husband (a_{m1}, a_{m2}) and wife (a_{f1}, a_{f2}).[8] Hence, the household specific effect is described by four combinations of the male and female heterogeneity points, G: (a_{m1}, a_{f1}), (a_{m1}, a_{f2}), (a_{m2}, a_{f1}) and (a_{m2}, a_{f2}), which are assumed to be constant for all households. For each of these combinations there exists a probability having these values of unobserved heterogeneity. This specification is flexible as it captures the correlation of the spouses‘ characteristics which are not observed. Note, for identification, only one mass point for each spouse is freely estimated; the other point is normalized to zero. The probabilities π_k, k $\in \{1, 2, 3, 4\}$ for the four combinations follow a multinomial distribution:

[7] This approach slightly differs from Wooldridge (2005) as means of the explanatory variables rather than the values at all points in time are included.

[8] Belzil (2001) employs a similar specification estimating a discrete duration model.

$$\pi_k = \frac{\exp(q_k)}{\sum_{j=1}^{4} \exp(q_j)}, \quad \sum_{k=1}^{4} \pi_k = 1 \tag{4}$$

where q_k are the transformed probability coefficients to be estimated. For identification q_1 is normalized to zero. Mass points and the transformed probabilities are jointly estimated with the parameters by maximum likelihood.[9] Standard errors for the probabilities are derived using the delta method. The likelihood to be maximized is then:

$$L = \prod_{i=1}^{n} \sum_{k=1}^{4} \pi_k(a^k) \prod_{t=1}^{T} \prod_{j=1}^{J} Pr(Y_{it} = j)^{d_{itj}}, \tag{5}$$

where $d_{itj} = 1$ if j is the chosen alternative and 0 otherwise. In the conditional logit framework variables which do not vary over alternatives, are not identified. Therefore, variables that are constant over alternatives (x_{it}, x_i) including the lagged dependent variable z_{it-1} and the initial state z_{i0} enter the specification as taste shifters of the preferences for income and leisure. State dependence is modeled in linear and quadratic terms of both spouses' leisure time in the previous period. The initial state enters in a similar way. The household specific error term is included in a flexible way as random coefficient of the leisure terms of both partners allowing for correlation of unobservable characteristics shifting the taste for the spouses' leisure time.

Specification of the Utility Function

For the specification of the utility function, I assume a quadratic utility function similar to Blundell, Duncan, McCrae, and Meghir (2000). Disposable net household income and the leisure of both spouses, their interaction and their quadratic terms enter the utility function. Hence, the utility function to be estimated has the following form:

$$\begin{aligned} V_{ijt} = \alpha_1 y_{ijt} + \alpha_2 lf_{ijt} + \alpha_3 lm_{ijt} + \alpha_4 y_{ijt}^2 + \alpha_5 lf_{ijt}^2 + \alpha_6 lm_{ijt}^2 \\ + \alpha_7 ylf_{ijt} + \alpha_8 ylm_{ijt} + \alpha_9 lmlf_{ijt}. \end{aligned} \tag{6}$$

I assume that the marginal utility of income and leisure varies across households by age, education, number and age of children, region, health status, nationality, the lagged dependent variable, the initial state and the random effect:

$$\alpha_1 = \beta_1 + \gamma_1 x_{1it}, \tag{7}$$

[9] The model is estimated using the -ml- command in Stata version 8.2.

$$\alpha_2 = \beta_2 + \gamma_2 x_{2it} + a_{fj}, \quad j \in \{1, 2\}, \tag{8}$$

$$\alpha_3 = \beta_3 + \gamma_3 x_{3it} + a_{mj}, \quad j \in \{1, 2\}, \tag{9}$$

where a_{f1} and a_{m1} are normalized to zero. The lagged dependent variable, the initial state and the mean values of all time varying characteristics are included in vectors (x_{1it}) and (x_{2it}) and enter the specification through the net household income and through the female leisure term. The previous employment state is defined as the realized leisure time in the previous period and enters in linear and quadratic terms.[10] To capture the disutility related to flexible arrangements, I follow van Soest (1995) and include dummy variables for the part time categories of women in vector (x_{1it}).

5 Empirical Results

5.1 Estimation Results

Table 5 contains the estimation results for the dynamic conditional logit panel data model with and without random effects. Both, the mass points and the probabilities are significant at the 5% level. This, and the Akaike Information Criterion[11] indicate that it is necessary to include random effects to control for unobserved individual effects. Therefore, for the following interpretation, I focus only on the model including random effects. However, despite of the significant difference, the coefficients are very similar in both specifications. This finding is in line with Michaud and Vermeulen (2004) who argue that the initial state captures most of the individual unobserved heterogeneity.

Preference for income and leisure vary with observed characteristics, such as education, number of children, age or region.[12] As expected, the presence of young children significantly increases preference for leisure of women. In line with previous studies, women and men living in East Germany, and non German spouses prefer to work more. Education

[10] More flexible specifications for the state dependence with vectors of dummy variables do not change the results of this analysis.

[11] The Akaike Information Criterion (AIC) rather than a standard likelihood ratio test has to be considered as under the null hypothesis the latter violates the regularity conditions, and thus its distribution is unknown. AIC is defined as $AIC = lnL - k$, where lnL is the log likelihood at the maximum and k the number of estimated parameters.

[12] As Wooldridge (2005) points out, effects of time constant variables such as education or the mean values of time variant explanatory variables cannot be identifies as they are partially correlated with the unobserved heterogeneity c_i.

seems to increase the taste for work. This effect is significant for men yet not for women. Taste shifters related to age are not always significant and do not display clear patterns. Men with a poor health status have a higher preference for leisure while for women this effect is not significant. Part time dummies are significantly negative; as stressed above this captures the disutility related to flexible arrangements.

The coefficients of the lagged dependent variables hint at positive state dependence in the labor supply behavior of women. Leisure time of the women in the previous period significantly increases the taste for leisure in the current period, yet at a decreasing rate as the quadratic term of the previous leisure term has a negative effect. The effect of the lagged leisure term of the male spouse on the wife‘s preference for leisure is very small and only weakly significant. The lagged leisure term of the man significantly reduces the preference for income in the current period which supports the hypothesis of state dependence. For the woman, this effect points in the same direction yet is not statistically significant. I have excluded potential effects of state dependence on the male labor supply as the focus of this paper is solely on female labor supply behavior.

For the interpretation of effects with multiple interactions, such as income and leisure, marginal effects, derivatives or elasticities need to be considered. Empirical derivatives with respect to leisure and income show that the theoretical implications of the utility function are fulfilled. For almost all households the concavity of the utility with respect to income is guaranteed. The derivatives with respect to leisure show that for a small part of the population an increase in leisure diminishes the utility; this result is line with previous studies and does not contradict the theoretical implications of the model (Euwals and van Soest, 1999).

5.2 Genuine State Dependence on the Extensive and Intensive Margin

In the following I will test the hypothesis of positive state dependence in female labor supply.

Posterior Probability of Discrete Alternatives

In order to derive the household specific probabilities for each working category it is necessary to draw on the posterior probability that is conditioned on the choice sequence of a household. This conditional probability explicitly accounts for the unobserved heterogeneity by assigning unobserved characteristics to each household (Skrondal and Rabe-Hesketh, 2004). I adapt the method described in Train (2003) who shows how to calculate posterior probabilities assuming a continuous parametric distribution. I derive the pos-

terior probabilities by calculating household specific weights for the four different mass point combinations. The weights w_{ik} are defined in the following way:

$$w_{ik} = \frac{P(\tilde{y}_{ik}|\mathbf{X_i}, a_i^k)}{\sum_{k=1}^{4} P(\tilde{y}_{ik}|\mathbf{X_i}, a_i^k)}, \tag{10}$$

where vector $(\tilde{y}_{ik})$ captures the chosen sequence of working alternatives conditioned on mass point combination k and matrix $\mathbf{X}_i$ that includes all explanatory variables over the observed period. The higher the probability of the chosen sequence given the mass point combination the higher the weight assigned to the combination. Skrondal and Rabe-Hesketh (2004) provide a detailed description about this method sometimes referred to as *Empirical Bayes* and discuss the properties of the prediction.

Conditioned on the estimated coefficients of the lagged dependent variable, I describe the transition process of labor supply by calculating a transition matrix $\mathbf{M}$. In the columns of the transition matrix the previous employment state is tabled, the rows show the choice of the working alternative in the current period. The transition matrix provides information about genuine state dependence as unobserved and observed characteristics are kept constant within each column except the lagged dependent variable. That implies all differences in the labor supply behavior conditioned on period $t-1$ can be attributed to the previous employment status which is state dependence.[13] The estimated state dependance is simply the difference in the probability within an column.

[Table 6 : about here]

The elements in the transition matrices are the average one-period transition probabilities summing over all women independent of their observed working behavior in period $t-1$. Standard errors of the probabilities have been estimated following Gong, van Soest, and Villagomez (2004) by repeating the simulation of the transition matrix for 100 draws from the estimated distribution of the parameter estimates. The estimated transition matrix clearly supports the hypothesis of state dependence on the extensive margin. The probability of inactivity in the current period conditional on not working in the period before is about 40%. For a woman who had been working in the last period this probability is according to the standard errors significantly lower. The difference increases with the number of working hours. For a full-time working woman the probability of inactivity in the next period is about 6% which is 34 percentage points lower; for a woman working over-time the difference amounts to more than 36 percentage points. For a woman who had been working part-time the difference in the probability not to work in the current

[13] Uhlendorff (2006) applies a similar approach when testing for state dependence in income dynamics.

period relative to the same average women who had been inactive, is lower, yet still important and significant. These findings are in line with the results of Prowse (2005); on the extensive margin she finds a higher level of genuine state dependence for full-time workers than for those in part-time work.

In contrast to previous studies on state dependence in the labor supply behavior of women, the method suggested here allows to analyze state dependence not only on the extensive but as well on the intensive margin, that is the impact of last period's employment on the number of hours worked. Comparing the choice probabilities on the intensive margin conditional on last period's employment, the picture is not clear cut. In most cases, the impact of the previous working behavior is not significant. This is in particular true when comparing choices conditional on neighboring employment states, such as full-time work vs. over-time work in the last period. The potential sources of state dependence, named above, explain the differences in the persistence between the extensive and the intensive margin. Fixed costs of work or other sources why the previous working history might affect preferences of the current labor supply, are more important on the extensive margin. Yet, with the similarity of the working alternatives the impact of these sources is decreasing.

Genuine State Dependence by Region and Age of Children

As discussed above, the working behavior of women differs with respect to several observed characteristics. In the German context, heterogeneity is mainly explained by differences between east and west Germany and differences between household with and without young children. Therefore, it is of interest not only to analyze the transition behavior and state dependence of the mean married women but as well differentiated by region and family status.

[Table 7 : about here]

As found in Table 2, the main difference between east and west German women is the higher labor market participation in the East and the different attitude towards part-time work. These differences can be mainly explained with the different historical background in both parts of Germany and with the better child care facilities for young children in the eastern part. For both, east and west German women, state dependence is highly significant and positive on the extensive margin though at a different level and of different size. Whereas in east Germany the state dependence between full-time work and inactivity amounts to about 0.23 percentage points, for west Germany the comparable state dependence is close to 0.36. This result supports the finding of Michaud and Tatsiramos (2005)

who show that South European countries with low labor market participation of women experience a higher state dependence than women in countries with higher participation rates, such as France or the UK. Turning to the intensive margin, again the effect of state dependence is either insignificant or ambiguous in both sub samples.

[Table 8 : about here]

The labor market participation of women with young children is very low in Germany, in particular for those with children younger than 3 years. One important reason for this is the low provision of subsidized child care facilities and the therefore high opportunity costs of women with young children (Wrohlich, 2006). Yet, as I have explicitly controlled for child care costs in the estimation, differences in the transition behavior of women with and without young children can not be related to different fixed costs of work due to children. State dependence on the extensive margin between the three groups, women with a child younger than three, a child between 3 and 6 years and without children or with children older than 6 exhibits the expected pattern. Yet compared to the very different labor market behavior - very low participation for women with children younger than 3 - the difference in state dependence between full-time and inactivity seems relatively modest. It varies from 33 percentage points for women without young children to about 42 percentage points for women with children between 3 and 6 years. The comparable state dependence for women with children younger than three is 38 percentage points. The same holds for the state dependence on the intensive margin. Between the three groups there are strong differences in the working behavior of the women participating on the labor market - if women with children younger than three work, they tend to choose the part-time categories whereas women without young children work more full-time and over-time. However, the state dependence on the intensive margin is either not statistically present or very similar between the groups.

5.3 The Dynamics of Labor Supply Behavior

To analyze the implication of state dependence for the labor supply behavior of women, I derive labor supply elasticities over time and analyze the dynamics of these elasticities. This analysis provides information to what extent state dependence leads to different adjustment mechanism over time given a change in the net household income. If state dependence is strongly positive, it needs several periods to adjust labor supply. In contrast, if state dependence is only weakly present or non existent, changes in the net household income affect labor supply immediately or in the short run.

Dynamic Labor Supply Elasticities using First Order Markov Process

As labor supply elasticities cannot be derived analytically within the employed discrete choice framework, I simulate the impact of an exogenous change of female gross hourly wage on her labor supply decision numerically. The elasticities are derived by calculating the simulated change in the predicted hours of work and in the participation rates induced by a 1% change in gross hourly wages. For the prediction of the working hours and the participation rate, I derive transition matrices under two different scenarios, the status quo and a simulated scenario that differs by a 1% higher hourly wage. Given the transition matrix and assuming a first order Markov transition process, I calculate transition matrices for future periods. The advantage of this procedure is that stochastic transition matrices conditional on the previous labor market status can be simply derived not only for period t but as well for future periods $t + k$. Technically this is done by taking the power with degree $t+k$ of the transition matrix $\mathbf{M}^{t+k}$, where t describes the period of interest. Hence, the transitions matrix after the second period is simply the square of the transition matrix of the first period, after period 3 the polynomial of the transition matrix to the power of three has to be calculated, and so on. The transition probabilities provide information about the average number of working hours and the average labor market participation rate at the end of each period. The average number of hours is calculated by taking the expected value of the working hours given the transition probabilities and the mean hours in the different working categories which are listed in Table 2. The participation rate is simply defined as the probability of working. Given the average number of working hours and the average participation rate in the status quo and assuming a 1% increase of gross hourly wages, it is straightforward to derive labor supply elasticities after each period. The labor supply elasticity in terms of hours of work is simply the relative change in working hours. Note, the elasticities presented here can not be directly compared to net wage elasticities derived in previous studies. Gross wage elasticities include both, the impact of the tax and benefit system as well as the pure behavioral effect. Further, the elasticities with respect to participation and hours of work can not be compared as extensive versus intensive elasticities as the working hours elasticity is an unconditional elasticity including both the intensive and extensive margin. I focus on this definition of elasticities because these are the elasticities derived in previous static discrete choice models, see e.g. van Soest (1995), or Haan and Steiner (2005).

Elasticities derived after the first period are defined as the short term elasticities. A Markov process converges in the long run. Formally, the steady state is reached if $t \to \infty$. Empirically, the steady state is reached if a further period does not affect the

transition matrix and the labor supply elasticities converge i.e. if they do not differ significantly. Before turning to the interpretation of the elasticities, it is necessary to discuss the assumptions underlining a first order Markov process. As stressed above, the Markov process allows to predict transitions for future periods. This is possible as a time constant transition process is assumed. In other words, it is assumed that individuals adjust their labor supply in each period with a constant rate. This certainly is a strong assumption, as it is ambiguous how the adjustment process behaves over time. In order to relax this assumption a higher order Markov process could be considered which remains for future work.

Short and Long Run Labor Elasticities

Table 9 contains the labor supply elasticities for all women, and separated by region and family status. Next to the average elasticities, bootstrapped values of the 5th and 95th percentiles are reported to perform significance tests.

[Table 9 : about here]

Elasticities are considered as being significantly different if the confidence intervals of the elasticities to compare do not overlap. The labor supply elasticities both in terms of participation and in terms of working hours are increasing over time for all groups. According to the bootstrapped confidence intervals this increase is significant between the first and the second period for all women and for most of the sub groups. Between the first and the second period elasticities markedly increase, nearly doubling in terms of participation and in terms of working hours they increase on average by more than 50%. After the second period elasticities still increase but only relatively modest, and elasticities do not significantly differ between the second and the third period. Thus, these results imply that in the third period the new steady state is reached. Compared to the short run, in the long run the elasticities with respect to participation and hours of work approximately double. The differences between the short and the long run can be related to state dependence. In the short run, state dependence prevents the women to fully adjust their labor supply. However, in the long run state dependence is circumvent and thus, the labor supply can be fully adjusted to the new optimal working behavior. The size and the dynamics of labor supply elasticities varies by groups. In line with previous findings about the labor supply behavior of German women, women living in west Germany and women with young children have the highest labor supply response.

6 Conclusion

In this paper I have developed an intertemporal discrete choice model of labor supply for married women. This model combines and extends previous studies by introducing state dependence in a structural discrete choice labor supply model that allows to study the extensive and the intensive margin of labor supply. Hence, behavioral changes of women over time with respect to labor market participation and working hours can be analyzed. The results of the empirical analysis support the hypothesis of positive state dependence in the choice of labor supply on the extensive margin. On the intensive margin state dependence is only modest or non existent. This is due to the fact that the impact of potential sources of state dependence, such as fixed cost, decrease with the similarity of the working behavior between two periods. Within the intertemporal model labor supply elasticities over time can be derived. Differentiated by groups the findings show that women with low labor market participation, namely women with young children and women living in west Germany, have the highest state dependence. I find that due to state dependence labor supply elasticities differ significantly between the short and the long run. State dependence prevents to immediately adjust the labor supply in the short run, yet in the third period the long run elasticity is reached and women have fully adjusted to their new optimal working behavior.

This study is not only interesting from a methodological point of view but as well for the evaluation of policy reforms. Employing this intertemporal framework it is possible to asses the short and long term labor supply effects of policy changes. In addition to the size of the labor supply effects this model can provide information about the process of adjustment of the labor supply behavior.

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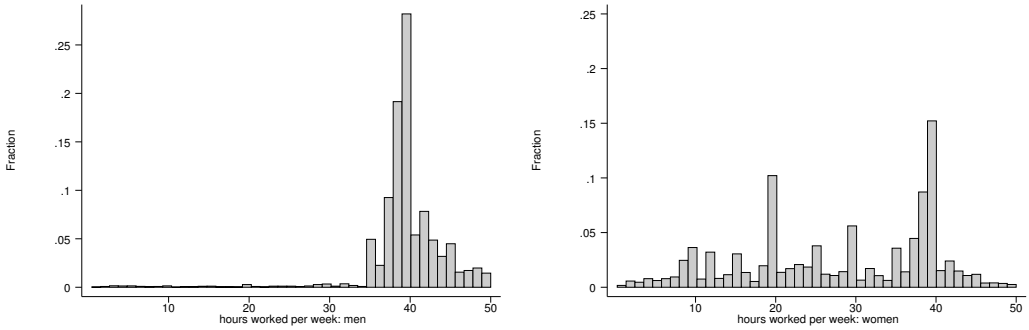
7 Figures

Figure 1: Distribution of weekly working hours



Source: SOEP, waves 1999-2003.

8 Tables

Table 1: Persistence in the employment of women

	Inactivity	Part-time work 1	Part-time work 2	Full-time work	Over-time work	All women (t)
Inactivity	1,019	95	59	63	17	1,253
Part-time work 1	127	460	89	7	5	688
Part-time work 2	79	121	1,203	86	11	1,500
Full-time work	35	11	84	894	129	1,153
Over-time work	6	3	20	125	193	347
All women (t+1)	1,266	690	1,455	1,175	355	4,941

The following working hours classifications (weekly) for women are used: 0, 0-24, 25-34, 35-40, >40.
Source: SOEP, wave 1999-2003

Table 2: Working hour categories

alternative	Share	Hours Women	Hours men	Net income	East-Germany
	%	per week	per week	in Euro	%
1	2.45	0	0	1280.45	42.15
2	1.52	19	0	1720.44	34.67
3	2.15	40	0	2166.73	40.57
4	13.56	0	37	2438.14	13.13
5	8.76	9.5	37	2672.49	4.85
6	17.69	24	37	2968.59	14.87
7	13.90	37	37	3205.27	36.39
8	3.46	45	37	3396.06	48.54
9	9.35	0	48	2845.57	16.23
10	5.16	9.5	48	3082.55	5.49
11	11.15	24	48	3386.72	20.15
12	7.29	37	48	3596.94	50.00
13	3.56	45	48	3794.72	46.59

The following working hours (weekly) classifications are used: men: 0, 0-40, >40; women: 0, 0-24, 25-34, 35-40, >40.
The overall share of households in east Germany is about 20%.
Net household income (monthly) is calculated on basis of the microsimulation model STSM. The net household income is the mean income in the given alternative.
Source: SOEP, wave 1999-2003, STSM

Table 3: Children by working hour categories

alternative	Hours Women	Hours men	child 0-3	child 3-6	Child Care Cost
	per week	per week	%	%	in Euro
1	0	0	13.22	22.31	0
2	19	0	2.67	10.67	0
3	40	0	6.60	11.32	0
4	0	37	16.87	18.96	0
5	9.5	37	5.54	17.78	214
6	24	37	2.06	8.81	214
7	37	37	0.29	5.09	614
8	45	37	1.17	3.51	614
9	0	48	19.05	25.76	0
10	9.5	48	7.45	11.37	214
11	24	48	2.90	10.89	214
12	37	48	0.56	4.17	614
13	45	48	1.14	5.11	614

The following hours classifications are used: men: 0, 0-40, >40; women: 0, 0-24, 25-34, 35-40, >40.
Share of households with at least one child in the given age interval.
Child care costs are expected monthly child care costs for households with children younger than 6 (Wrohlich, 2006).
Source: SOEP, wave 1999-2003

Table 4: Descriptive Statistics by Year

	Mean	Std.	Mean	Std.	Mean	Std.
Year	2000		2001		2002	
Monthly net household income in Euro	2944	1017	3101	1190	3162	1213
Age of the husband	41.92	6.84	42.93	6.84	43.93	6.83
Age of the wife	39.87	6.85	40.87	6.85	41.87	6.86
Husband is German	0.89	0.31	0.90	0.31	0.90	0.30
Wife is German	0.89	0.31	0.90	0.30	0.90	0.30
No degree (husband)	0.02	0.14	0.02	0.14	0.02	0.14
Medium degree (husband)	0.78	0.42	0.78	0.42	0.78	0.42
High degree (husband)	0.20	0.40	0.20	0.40	0.20	0.40
No degree (wife)	0.02	0.13	0.02	0.13	0.02	0.13
Medium degree (wife)	0.83	0.37	0.83	0.37	0.83	0.37
High degree (wife)	0.15	0.36	0.15	0.36	0.15	0.36
Health status of husband[1]	0.01	0.10	0.01	0.11	0.02	0.12
Health status of wife[1]	0.01	0.10	0.01	0.10	0.01	0.10
Couple living in East Germany	0.23	0.42	0.23	0.42	0.23	0.42
Household with child younger 3 years	0.07	0.26	0.06	0.24	0.06	0.23
Household with child between 3 and 6 years	0.16	0.37	0.13	0.33	0.08	0.27
Weekly working hours of husband in period t	39.94	10.23	38.69	10.97	37.63	12.12
Weekly working hours of husband in period t-1	39.13	10.47	39.94	10.23	38.69	10.97
Weekly working hours of husband in the initial state[2]	39.13	10.47	39.13	10.47	39.13	10.47
Weekly working hours of wife in period t	20.62	15.64	20.28	15.25	20.27	15.10
Weekly working hours of wife in period t-1	20.32	15.38	20.62	15.64	20.28	15.25
Weekly working hours of wife in the initial state[2]	20.32	15.38	20.32	15.38	20.32	15.38
Observations	1647		1647		1647	

1)Percentage of people who are with 100% disabled.
2)Initial state is the working behavior in the year 1999
Source: SOEP, wave 1999-2003 and STSM

Table 5: Estimation Results

	Coef.	Std.	Coef.	Std.
Net Income				
Age - Man	-38.089	12.571	-36.557	15.277
Age^2 - Man	46.904	14.486	45.608	17.549
Age - Woman	17.661	9.493	18.269	12.165
Age^2 - Woman	-21.350	11.369	-22.318	14.565
Leisure t-1 - Man	-0.085	0.006	-0.051	0.006
Leisure t-1 - Woman	-0.011	0.006	-0.007	0.007
Leisure t-0 - Man	-0.050	0.005	-0.058	0.007
Leisure t-0 - Woman	-0.007	0.006	-0.012	0.007
Constant	11.474	2.444	10.876	3.109
Net Income^2	-0.085	0.023	-0.138	0.031
Leisure Man				
Age - Man	0.111	0.467	0.071	0.542
Age^2 - Man	1.088	0.403	1.180	0.496
German - Man	-0.007	0.024	0.001	0.026
East German - Man	-0.014	0.069	-0.016	0.087
Health Status - Man	-0.006	0.034	0.002	0.036
Medium Education Degree - Man	-0.024	0.007	-0.030	0.009
High Education Degree - Man	-0.048	0.009	-0.048	0.011
Age - Man	-0.009	0.003	-0.009	0.003
Health Status - Man	0.023	0.036	0.009	0.039
German - Man	-0.003	0.024	-0.008	0.026
East German - Man	0.023	0.070	0.032	0.088
Constant	0.438	0.071	0.413	0.095
Leisure Man^2	-0.003	0.000	-0.004	0.000
Leisure Woman				
Age - Woman	-0.281	0.456	-0.204	0.549
Age^2 - Woman	0.601	0.403	0.368	0.514
German - Woman	-0.038	0.039	-0.044	0.041
East German - Woman	-0.152	0.114	-0.168	0.127
Health Status -Woman	-0.063	0.047	-0.077	0.051
Child 0-3	0.122	0.019	0.142	0.021
Child 3-6	0.013	0.011	0.022	0.012
Medium Education Degree - Woman	-0.005	0.014	-0.002	0.017
High Education Degree - Woman	-0.028	0.015	-0.026	0.018
Leisure t-1 - Man	-0.002	0.001	-0.002	0.001
Leisure t-1 - Woman	0.012	0.001	0.006	0.002
Leisure^2 t-1 - Man	0.000	0.001	0.001	0.001
Leisure^2 t-1 - Woman	-0.004	0.001	-0.001	0.001
Leisure t-0 - Man	-0.001	0.000	-0.001	0.000
Leisure t-0 - Woman	0.004	0.000	0.005	0.000
Age - Woman	0.000	0.003	0.001	0.003
Child 0-3	0.029	0.022	0.074	0.025
Child 3-6	-0.027	0.013	-0.035	0.015
Health Status - Woman	0.095	0.052	0.129	0.059
German - Woman	0.032	0.039	0.040	0.042
East German - Woman	0.145	0.114	0.161	0.127
Constant	0.303	0.080	0.451	0.103
Leisure Woman^2	-0.007	0.000	-0.008	0.000
Net Income*Leisure Man	0.006	0.003	-0.001	0.004
Net Income*Leisure Woman	0.008	0.002	0.006	0.003
Leisure Man*Leisure Woman	0.095	0.152	-0.152	0.169
Part Time 1	-1.261	0.075	-1.288	0.081
Part Time 2	-0.617	0.079	-0.727	0.086
Mass point - Woman			-0.210	0.016
Mass point - Man			0.306	0.013
p1			0.233	0.017
p2			0.0305	0.0078
p3			0.690	0.0569
p4			0.0458	0.0126
Observations	4941		4941	
Log-Likelihood	-8304.1324		-8012.5694	
Derivatives				
$U_y > 0$	95%		95%	
$U_{lf} > 0$	70%		70%	
$U_{lm} > 0$	95%		75%	

Time dummies for the year 2001 and 2002 have been included.
Variables in *italic* are the individual mean values.
Unobserved heterogeneity is assumed to follow a non parametric distribution. For both, men and women 1 mass points is freely estimated. Probabilities p2-p4 are estimated, p1 is derived following the underlining assumption $\sum_{m=1}^{M} P_i(a_i^m) = 1$. To guarantee plausible results a multinomial specification of the probabilities, rather than the probabilities p2-p4, has been estimated. The standard errors of the probabilities are derived using the delta method.
Source: SOEP, wave 1999-2003 and STSM

Table 6: Transition Matrix of Women: all Women

	Inactivity (t)	Part-time work 1 (t)	Part-time work 2 (t)	Full-time work (t)	Over-time work (t)
Inactivity (t-1)	0.403	0.266	0.288	0.040	0.002
	0.014	*0.011*	*0.015*	*0.006*	*0.001*
Part-time work 1 (t-1)	0.293	0.245	0.374	0.082	0.006
	0.008	*0.010*	*0.008*	*0.007*	*0.001*
Part-time work 2 (t-1)	0.154	0.184	0.453	0.185	0.024
	0.010	*0.006*	*0.014*	*0.007*	*0.002*
Full-time work (t-1)	0.065	0.104	0.444	0.319	0.067
	0.008	*0.010*	*0.010*	*0.013*	*0.005*
Over-time work (t-1)	0.039	0.067	0.400	0.388	0.106
	0.007	*0.010*	*0.012*	*0.020*	*0.009*

The following hours classifications are used: 0, 0-24, 25-34, 35-40, >40.
Standard errors are given in *italic*. Standard errors are derived using bootstrapping with 100 replications.
Source: SOEP, wave 1999 -2003

Table 7: Transition Matrix of Women: by region

	Inactivity (t)	Part-time work 1 (t)	Part-time work 2 (t)	Full-time work (t)	Over-time work (t)
	West Germany				
Inactivity (t-1)	0.448	0.272	0.249	0.030	0.002
	0.016	*0.010*	*0.014*	*0.005*	*0.000*
Part-time work 1 (t-1)	0.332	0.260	0.341	0.062	0.005
	0.009	*0.010*	*0.009*	*0.006*	*0.001*
Part-time work 2 (t-1)	0.179	0.203	0.448	0.151	0.018
	0.010	*0.008*	*0.015*	*0.006*	*0.002*
Full-time work (t-1)	0.078	0.119	0.469	0.280	0.054
	0.010	*0.011*	*0.012*	*0.013*	*0.004*
Over-time work (t-1)	0.048	0.078	0.433	0.354	0.088
	0.009	*0.013*	*0.013*	*0.021*	*0.010*
	East Germany				
Inactivity (t-1)	0.256	0.246	0.417	0.077	0.005
	0.015	*0.014*	*0.015*	*0.012*	*0.001*
Part-time work 1 (t-1)	0.171	0.193	0.476	0.146	0.013
	0.009	*0.010*	*0.011*	*0.015*	*0.002*
Part-time work 2 (t-1)	0.080	0.123	0.458	0.295	0.045
	0.007	*0.006*	*0.016*	*0.013*	*0.005*
Full-time work (t-1)	0.026	0.063	0.358	0.437	0.115
	0.005	*0.007*	*0.011*	*0.013*	*0.009*
Over-time work (t-1)	0.012	0.038	0.292	0.486	0.172
	0.004	*0.008*	*0.014*	*0.015*	*0.014*

The following hours classifications are used: 0, 0-24, 25-34, 35-40, >40.
Standard errors are given in *italic*. Standard errors are derived using bootstrapping with 100 replications.
Source: SOEP, wave 1999 -2003

Table 8: Transition Matrix of Women: by family status

	Inactivity (t)	Part-time work 1 (t)	Part-time work 2 (t)	Full-time work (t)	Over-time work (t)
	Household without young children				
Inactivity (t-1)	0.350	0.278	0.322	0.047	0.003
	0.015	*0.012*	*0.015*	*0.007*	*0.001*
Part-time work 1 (t-1)	0.239	0.247	0.411	0.094	0.008
	0.009	*0.010*	*0.010*	*0.009*	*0.001*
Part-time work 2 (t-1)	0.107	0.174	0.479	0.211	0.028
	0.008	*0.007*	*0.016*	*0.009*	*0.003*
Full-time work (t-1)	0.032	0.090	0.446	0.355	0.077
	0.006	*0.011*	*0.011*	*0.014*	*0.005*
Over-time work (t-1)	0.014	0.053	0.388	0.426	0.119
	0.004	*0.011*	*0.016*	*0.021*	*0.011*
	Household with children younger 3 years				
Inactivity (t-1)	0.874	0.105	0.021	0.000	0.000
	0.013	*0.010*	*0.005*	*0.000*	*0.000*
Part-time work 1 (t-1)	0.811	0.140	0.048	0.001	0.000
	0.018	*0.011*	*0.009*	*0.001*	*0.000*
Part-time work 2 (t-1)	0.672	0.189	0.131	0.008	0.000
	0.027	*0.014*	*0.017*	*0.002*	*0.000*
Full-time work (t-1)	0.493	0.215	0.261	0.028	0.002
	0.041	*0.015*	*0.029*	*0.005*	*0.001*
Over-time work (t-1)	0.389	0.214	0.341	0.050	0.006
	0.053	*0.014*	*0.039*	*0.010*	*0.002*
	Household with children between 3 and 6 years				
Inactivity (t-1)	0.590	0.238	0.156	0.015	0.001
	0.018	*0.009*	*0.013*	*0.003*	*0.000*
Part-time work 1 (t-1)	0.479	0.253	0.232	0.033	0.003
	0.018	*0.009*	*0.013*	*0.005*	*0.001*
Part-time work 2 (t-1)	0.305	0.238	0.363	0.085	0.010
	0.021	*0.009*	*0.020*	*0.007*	*0.001*
Full-time work (t-1)	0.165	0.169	0.466	0.169	0.030
	0.020	*0.015*	*0.021*	*0.014*	*0.004*
Over-time work (t-1)	0.115	0.126	0.482	0.227	0.051
	0.020	*0.017*	*0.015*	*0.024*	*0.007*

The following hours classifications are used: 0, 0-24, 25-34, 35-40, >40.
Standard errors are given in *italic*. Standard errors are derived using bootstrapping with 100 replications.
Source: SOEP, wave 1999-2003

Table 9: Labor Supply Elasticities by Region and Family Status

Period	All Women	West Germany	East Germany	No young child	Children 0-3	Children 3-6
			Labor Market Participation			
1	0.0332	0.0351	0.0278	0.0287	0.1807	0.0326
	(0.0269 - 0.0390)	(0.0290 - 0.0405)	(0.0227 - 0.0347)	(0.0225 - 0.0339)	(0.1291 - 0.2328)	(0.0232 - 0.0433)
2	0.0564	0.0638	0.0355	0.0464	0.3281	0.0640
	(0.0460 - 0.0655)	(0.0534 - 0.0736)	(0.0291 - 0.0430)	(0.0377 - 0.0554)	(0.2111 - 0.3806)	(0.0414 - 0.0878)
3	0.0681	0.0784	0.0385	0.0555	0.3343	0.0757
	(0.0548 - 0.0800)	(0.0663 - 0.0905)	(0.0312 - 0.0463)	(0.0444 - 0.0673)	(0.2114 - 0.3719)	(0.0456 - 0.1054)
4	0.0732	0.0848	0.0397	0.0597	0.3246	0.0786
	(0.0584 - 0.0868)	(0.0720 - 0.0980)	(0.0318 - 0.0476)	(0.0472 - 0.0731)	(0.2062 - 0.3573)	(0.0460 - 0.1092)
5	0.0754	0.0874	0.0401	0.0616	0.3234	0.0791
	(0.0599 - 0.0898)	(0.0744 - 0.1011)	(0.0320 - 0.0481)	(0.0483 - 0.0758)	(0.2045 - 0.3528)	(0.0457 - 0.1093)
			Working Hours			
1	0.0921	0.0969	0.0799	0.0868	0.2334	0.0868
	(0.0751 - 0.1087)	(0.0790 - 0.1150)	(0.0637 - 0.0969)	(0.0718 - 0.1028)	(0.1642 - 0.3018)	(0.0613 - 0.1147)
2	0.1419	0.1541	0.1085	0.1304	0.4197	0.1385
	(0.1161 - 0.1636)	(0.1264 - 0.1830)	(0.0842 - 0.1311)	(0.1050 - 0.1536)	(0.3099 - 0.5559)	(0.0908 - 0.1731)
3	0.1650	0.1812	0.1187	0.1503	0.4258	0.1577
	(0.1350 - 0.1869)	(0.1487 - 0.2152)	(0.0905 - 0.1429)	(0.1188 - 0.1765)	(0.3260 - 0.5501)	(0.0986 - 0.1881)
4	0.1750	0.1928	0.1224	0.1592	0.4107	0.1630
	(0.1430 - 0.1963)	(0.1581 - 0.2290)	(0.0924 - 0.1470)	(0.1243 - 0.1867)	(0.3165 - 0.5252)	(0.0996 - 0.1894)
5	0.1793	0.1976	0.1237	0.1631	0.4057	0.1641
	(0.1464 - 0.1999)	(0.1619 - 0.2346)	(0.0929 - 0.1484)	(0.1266 - 0.1911)	(0.3125 - 0.5182)	(0.0994 - 0.1886)

The 5th and 95th percentiles are given in brackets they are derived using bootstrapping with 100 replications.
Source: SOEP, wave 1999-2003